

resultant weather. The hot, dry north to east winds which do so much damage to the grain crop east of the Cascades, do not occur until after the summer type of weather conditions appears; this fact is gradually becoming known among the farmers east of the Cascades, hence the importance of such information to the farmers as well as to the merchants.

Rain forecasts were issued on several days and they were verified in every instance.

The valuable work of the month was the river forecasts, which were continued until the close of the month. Daily river bulletins were discontinued on the 15th. The value of the river forecasts is shown by the following extracts made from a few of the many letters received:

Boyd & Arnold, Portland, Oreg.:

* * * And testify to the uniform correctness of your forecasts, which we verified daily, while we feared the water would reach our office, but when you, June 19, stated that "there is practically no danger of Front street being flooded," we had full faith and discontinued our measurements. We appreciate the value the river bulletins are to our business men.

T. M. Sinclair & Co., Portland, Oreg.:

We desire to acknowledge the benefit we have received from the very accurate information contained therein, and the timely warnings which prevented any loss to ourselves. The bulletin is useful also in preventing its readers in going to much unnecessary expense in the removal of goods, as the precise data inspire confidence which the vivid imaginings of the old timer and river men can not upset.

Simonds Manufacturing Co., Portland, Oreg.:

We wish to congratulate you on the splendid way in which you have conducted the River Bulletin service. It has proved a great help to us; we have been able to make our plans with a greater degree of certainty than ever before.

R. Scott, Milwaukee, Oreg. (Farmer):

I found the river bulletins to be very useful, as I own land which overflows.

Meyer, Wilson & Co., Portland, Oreg.:

The bulletins have been of great service to us in that we have been saved considerable worry, if not large expense. We always have large stocks of salt, cement, etc., easily damaged or destroyed by water, stored on the docks and we would have to move same, when a flood is threatened, were it not for the information contained in your river bulletins.

Willamette Tent and Awning Co., Portland, Oreg.:

They have been of great value to us, as we carry a large stock, and your bulletins have informed us as to what we could expect regarding the high water, and thus make arrangements in time to prevent an enormous loss. The bulletins are certainly appreciated and they are of big value to every merchant in Portland and vicinity.

Henry Everding, Portland, Oreg.:

Your accurate River Bulletins have been of great value to us.

B. S. Pague, Forecast Official.

SAN FRANCISCO FORECAST DISTRICT.

The month was comparatively quiet, and there was no cause for the display of signals.

The study of the vertical thermal gradient in the vicinity of San Francisco was continued, and an effort made to use the data in daily forecasts of temperature changes for the Sacramento Valley.

On July 10 showers occurred in Arizona, New Mexico, and northwestern Texas which were generally forecast. The low central over Arizona moved slowly northward as anticipated, and warnings of rain along the valley of the Colorado were issued. During the middle of July rains were frequent over Arizona. On July 18 a thunderstorm occurred at Yuma with a maximum wind velocity of 42 miles from the north.

An attempt was made to furnish warnings of these Sonora rains to the transportation companies running through Arizona, New Mexico, and southern California. The following

extract is from a letter from the general manager of the Santa Fe route:

The great difficulty, so far as washouts are concerned, is that the washouts have not been occasioned so much by the rain falling in the immediate vicinity of our tracks as from rain falling on other portions of the watershed. In this mountainous country the water comes down in torrents with the greatest of velocity, and frequently causes washouts in very high portions of the watershed. The water, instead of seeking the natural fall of the land, frequently takes the highest portions. This has been the history of the majority of our washouts west of the Rockies. Predictions as to storms in such cases are, of course, of little advantage to us, as we are never able to tell where the water will damage us.

Alexander G. McAdie, Forecast Official.

AREAS OF HIGH AND LOW PRESSURE.

During the month there were six highs and seven lows, traced on Charts I and II. As usual in the summer months, it has been very difficult to definitely locate the centers of these high and low areas, and it should be noted that the phenomena are not anything like as clearly defined as the charts seem to show.

The accompanying table gives the principal facts regarding the origin and development of these areas of high and low pressure, and the following general remarks are added:

Highs.—One of the highs, No. V, began upon the north Pacific coast, and the remaining five were first noted to the north of Montana, or in the extreme northwest. The general tendency was toward the east. No. I was last seen in Ontario, No. III in Illinois, and the remainder disappeared off the middle or north Atlantic coasts.

Lows.—Nos. I, V, and VII were first noted to the north of Montana, Nos. III, IV, and VI in the middle Plateau region, and No. II in Illinois. The general tendency was to the east and northeast, and all disappeared off the north Atlantic or in the Gulf of St. Lawrence.

The highest winds of the month were as follows: On the evening of July 7 Cleveland reported a northwest wind of 52 miles an hour. The next evening Cape May experienced a south wind of 38 miles. On the morning of the 9th Cleveland reported northwest 44 miles. On the evening of the 12th New York City had a northwest wind of 40 miles, and on the evening of the 27th the same station reported a northwest wind of 52 miles an hour.—H. A. Hazen, Professor.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.							<i>Miles.</i>	<i>Days.</i>	<i>Miles.</i>	<i>Miles.</i>
I.....	4, a. m.	53	105	6, p. m.	48	82	1,080	2.5	432	18.0
II.....	6, a. m.	54	109	12, a. m.	44	68	3,060	6.0	510	21.2
III.....	14, p. m.	47	114	18, p. m.	40	92	1,530	4.0	382	15.9
IV.....	20, p. m.	48	92	25, p. m.	45	58	2,370	5.0	474	19.8
V.....	23, a. m.	49	124	28, p. m.	38	73	2,820	5.5	513	21.4
VI.....	27, p. m.	53	117	†1, p. m.	41	67	3,150	5.0	630	26.2
Total.....							14,010	28.0	2,941	122.5
Mean of 6 paths.....							2,335		490	20.4
Mean of 28.0 days.....									500	20.8
Low areas.										
I.....	*30, p. m.	53	104	3, a. m.	48	57	2,130	2.5	852	35.5
II.....	4, p. m.	43	90	7, a. m.	44	68	1,140	2.5	456	19.0
III.....	4, p. m.	41	110	10, p. m.	51	65	3,080	6.0	505	21.0
IV.....	13, p. m.	38	102	19, a. m.	50	59	2,280	5.5	415	17.3
V.....	16, p. m.	54	117	21, p. m.	46	69	2,250	5.0	450	18.7
VI.....	19, p. m.	44	115	26, p. m.	48	69	2,390	7.0	341	14.2
VII.....	26, p. m.	54	112	31, a. m.	48	63	2,380	4.5	502	20.9
Total.....							15,480	33.0	3,521	146.6
Mean of 7 paths.....							2,211		503	20.9
Mean of 33.0 days.....									469	19.5

* June. † August.